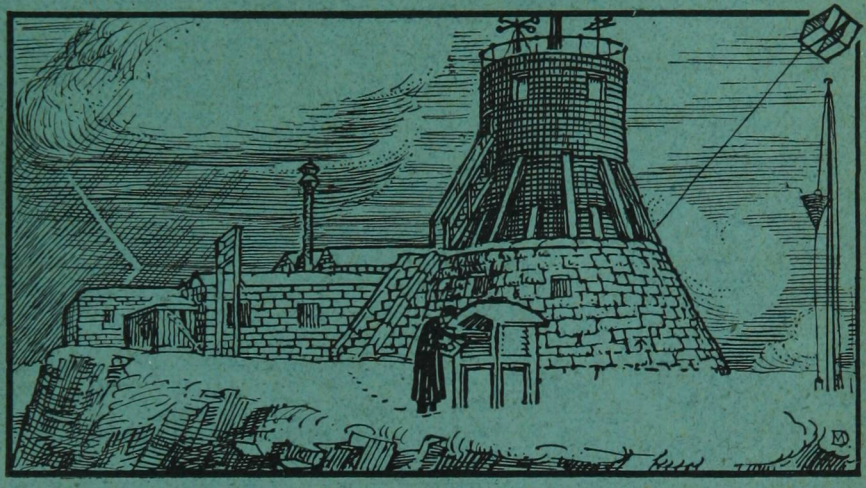
NO. 551 SYMONS'S VOL. 46

METEOROLOGICAL MAGAZINE

EDITED BY HUGH ROBERT MILL



DECEMBER, 1911.

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LONDON: EDWARD STANFORD, 12, 13 & 14, LONG ACRE, W.C.

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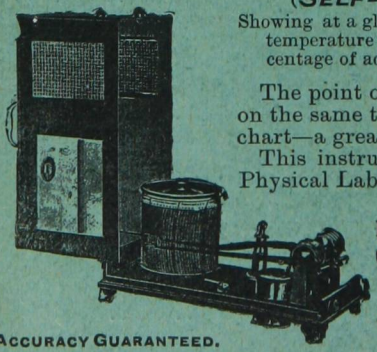

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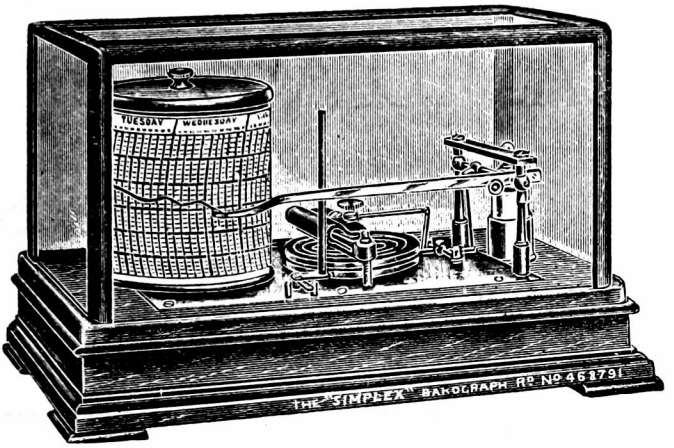

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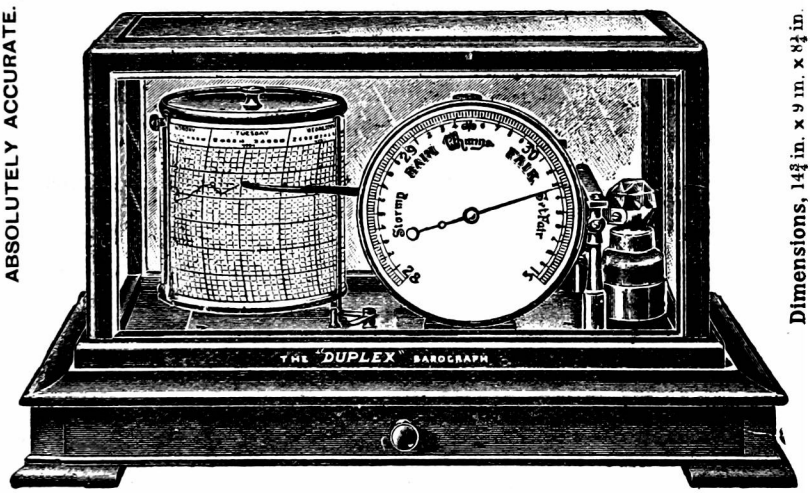

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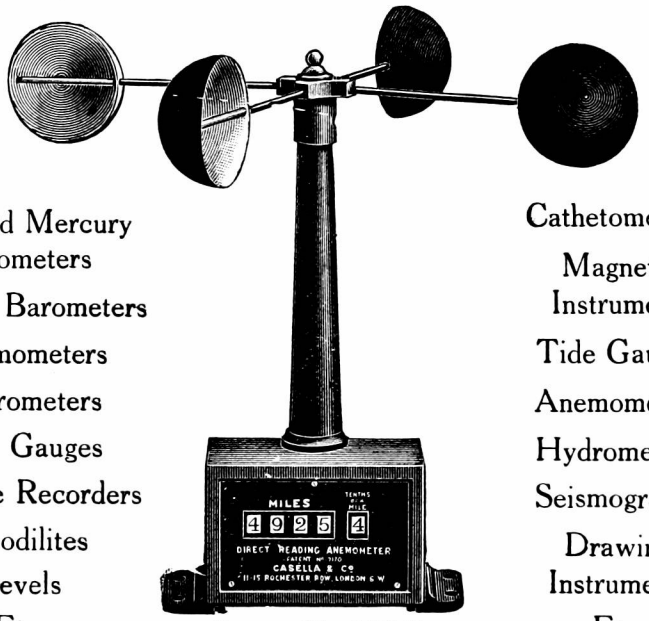

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Symons's
Meteorological Magazine.

No. 551. DECEMBER, 1911. Vol. XLVI.

WEATHER IN THE SEVENTEENTH CENTURY.

By Walter Sedgwick, M.A.

Part IV.—Winter.

In the concluding article of this series it is proposed to consider the information given in the diaries of Evelyn and Pepys about the weather in the winter months (December, January and February). This information is more complete and in several respects more interesting than the accounts given of the weather in the other seasons of the year. The diaries throw considerable light on that much discussed question, the character of the old-fashioned winter, and Evelyn gives a long account of the historical winter of "Frost Fair" (1683–4).

It is fortunately possible, when dealing with non-instrumental observations, to make a more reliable comparison between the weather at different epochs during winter than during the other seasons, because in the case of winter we can compare the frequency of frost and snow, which are dependent on definite physical conditions, whereas in the case of the other seasons we have to rely largely on comparisons of such statements as "exceeding cold" or "extraordinary warmth," which are dependent on indefinite or unknown quantities, as for instance the temperament of the observer and the average conditions of weather at the time when the statements were made.

The popular opinion about the winters of the past is that they were more severe with heavier snowfalls and more prolonged frosts, and that wintry conditions set in before Christmas, and it is interesting to investigate both these views. When doing so it is necessary to keep in mind the great advance which has been made in the past two centuries in the conveniences and comforts of civilization. In the 17th century traffic was only carried on along badly kept roads and lanes, which were often quagmires, or by water, and consequently a fall of snow or spell of cold weather would have caused

far more discomfort and interference with daily life than they do now. It is therefore reasonable to conclude that the diarists of the 17th century would record as specially noticeable slight snow falls and frosts which would be scarcely noticed by the town dwellers of to-day, and allowance must be made for this when contrasting descriptions of the weather in winter given by the writers of that era with the actual weather experienced in the winters of our time.

Dealing first with the general character of winter weather as recorded in the diaries three points can be considered: (1) the records of snow, (2) the records of frosts, and (3) the number of mild winters. On reading the extracts at the end of this article it will be found that the recorded instances of snow are surprisingly few. There are only 13 winters in the whole series covered by the diaries in which snow is mentioned, *i.e.*, December 1662, January 1665, February 1666, February 1672, December 1676, December 1680, January 1689, January 1690, February 1692, January 1695, January 1696, December—January—February, 1696—7, and January, 1701. Of these snowfalls only three appear to have been prolonged, *i.e.*, December 1676, January 1695, and December—January—February, 1696—7, and against the long continuance of snow in the winter of 1696—7 there can be set Pepys' observation on the 7th December, 1662, "At my waking I found the tops of the houses covered with snow, which is a rare sight which I have not seen these three years." As far as the accounts of snow are considered there is certainly no reason for thinking that the winters in the time of Evelyn were more severe than those of our own time, rather the reverse.

Turning now to the second point, the records of frost, it does appear at first sight as if Evelyn experienced in his lifetime more prolonged frosts than have occurred in the past half century. In the first place there is the severe frost of 1683—4 (Frost Fair) which far surpassed in severity any frost within living memory, and there are no less than five winters in which Evelyn describes the Thames as being frozen, *i.e.*, February 1649, December 1662, January—February 1684, January 1685, and January 1695, and possibly also January 1689. No positive conclusion can, however, be drawn from the winter of Frost Fair, because not only did it surpass in severity all winters experienced by those now living but it also surpassed in severity all other winters in the lifetime of Evelyn. Attention should, therefore, be more especially directed to the number of occasions upon which the Thames is stated to have been frozen. It is noticeable that the description of the Thames as frozen is used somewhat loosely, and does not always mean frozen right across (*vidé* the entry on the 11th December, 1662, "I went home by water, but not without exceeding difficulty, the Thames being frozen, great flakes of ice encompassing our boat") and in no winter except that of Frost Fair does Evelyn refer to the Thames as bearing pedestrian traffic. It must also be remembered that the Thames at London was in Evelyn's time a different river to what it is to-day. Then it flowed

for the most part between mud flats, now between embankments, and it is probable that it was in Evelyn's time a more sluggish river than it is now, and that ice would have formed more readily on its banks. This view is supported by the observations of the diarists on the 11th December, 1662, from which it appears that on the day when skating commenced on the canal in St. James's Park, ice was found on the Thames and the river was described as being frozen. Finally on this point attention is called to the very few winters in which the observations given in the diaries indicate a prolonged frost. Possibly six can be so described, *i.e.* 1658, December 1662, January 1665, 1683—4, 1694—5, and 1696—7, and of these only the frosts of 1683—4 and 1696—7 seem to have been so prolonged and severe as the great frosts of 1890—1 and January—February 1895.

As regards the third point, the frequency of mild winters, we find that at least 11 very mild or wet winters occurred in Evelyn's lifetime, *i.e.*, 1648, 1660—1, 1661—2, 1670—1, 1685—6, 1686—7, 1689—90, 1691—2, 1692—3, 1695—6, and 1699—1700, and those who maintain that the old-fashioned winters were *always* severe will have difficulty in reconciling their opinions with the following observations :—

1661. January 31.—The ways are dusty and the flies fly up and down, and the rose bushes are full of leaves.
1662. January 25.—Near as warm as at midsummer in some years.
1662. December 8.—A very hard frost, which is news to us after having none almost these three year.
1686. January 29.—So wet and mild a season had scarce been seen in man's memory.
1687. January 8.—Little appearance of any winter as yet.
1690. January 21.—The winter has been hitherto extremely wet, warm and windy.
1693. February 14.—Hitherto an exceeding mild winter.
1699. December 13.—Calm, bright and warm as in the middle of April. So continued on 31st January (21st O.S.)

In short, when all the information given in the two diaries about the winter weather during the half century which they cover, is considered together, it does not appear that cold winters were more frequent or mild winters less frequent then than they have been in the past fifty years, or that the average severity of the winters in the time of the diarists was greater than at the present time.

There now remains for enquiry the other common view about the old-fashioned winters, *i.e.*, that wintry conditions commenced earlier and usually prevailed at Christmas Day. This view is certainly not substantiated by the two diaries, and it will be observed from the extracts below that on six occasions only is a continuance of cold weather described in December, whereas in a considerable majority of winters the first entry about snow or frost is in January or even later. Attention, however, is specially called to the fact that the

dates ascribed below to the extracts have been corrected to the Gregorian calendar (N.S.), and are not the dates given in the diaries, which are according to the Julian calendar (O.S.). In Evelyn's lifetime the New Style was in use throughout the greater part of western Europe, but had not been adopted in England, and the difference between the two calendars, which was fully explained in the May number of this Magazine, amounted in the 17th century to ten days. Consequently the retention of the Old Style in England made Christmas Day then correspond with January 4th of the present time, and if the diaries are considered with the dates uncorrected it will be found that wintry conditions began in at least four other years before Christmas, *i.e.*, 1664, 1666, 1683 and 1695, and probably also in two more, *i.e.*, 1684 and 1696, thereby doubling the number of years with wintry weather in December. It therefore appears, as indeed it is reasonable to have expected, that the error which had arisen in the calendar year by the use of the Julian calendar did have the effect of making the number of Christmas Days on which the country was under the influence of wintry weather more frequent than at the present time, and the fact that during the 17th century and the first half of the 18th, Christmas Day did not occur in England until 13 or 14 days after the winter solstice, probably did contribute to the prevalent belief that at Christmas time the country should be under the conditions usually depicted on Christmas cards. It is, however, clear that even under the Julian calendar there were many years with mild weather at Christmas, and the widely-held opinion about the severe character of the Christmas weather in the old-fashioned winters cannot be substantiated from the diaries.

The sequence of winter weather experienced in the two periods during which fairly continuous information is given in the diaries was as follows :—

1660-1.	Very mild.	1689-90.	Mild and wet.
1661-2.	Very mild.	1690-1.	Cold December.
1662-3.	Cold December.	1691-2.	Very mild and dry until February.
1664-5.	Severe.	1692-3.	Very mild.
1665-6.	Variable.	1694-5.	Severe.
1666-7.	Frost in January.	1695-6.	Mild and wet.
1683-4.	Very severe.	1696-7.	Severe.
1684-5.	Severe.	1698-9.	Mild.
1685-6.	Very mild and wet.	1699-1700.	Mild and dry until February.
1686-7.	Mild.		
1688-9.	Cold.		

Note.—In the following extracts the dates *have been corrected* to New Style. Extracts from Pepys' diary are distinguished thus—(P.); all other extracts are from Evelyn's diary.

1648. This was a most exceeding wet year, neither frost nor snow all the winter for more than six days in all.

1649. 1 February.—Now was the Thames frozen over, and horrid tempests of wind.

1656. 28 January.—Being a great frost, but a mist falling as I returned.

1658. [17 March.]—This had been the severest winter that any man alive had known in England. The crows' feet were frozen to their prey. Islands of ice enclosed both fish and fowl frozen, and some persons in their boats.

1660-1. 31 January.—It is strange what weather we have had all this winter; no cold at all; but the ways are dusty and the flies fly up and down and the rosebushes are full of leaves such a time of the year as was never known in this world before here. (P.)

1661-2. 25 January.—Great rain had fallen without any frost or seasonable cold, not only in England, but in Sweden, and the most northern parts, being here near as warm as at Midsummer in some years.

,, —A fast day ordered by the Parliament to pray for more seasonable weather it having hitherto been summer weather, that it is both as to warmth and every other thing just as if it were the middle of May or June. (P.)

27 February.—This night and the next day fell such a storm of hail, thunder and lightning as never was seen the like in any man's memory, especially the tempest of wind, being south-west, which subverted besides huge trees, many houses, innumerable chimneys . . . .

,, —Extraordinary wind . . . . (such as hath not been in memory before unless at the death of the late Protector) . . . . broke down part of several houses . . . . (P.)

1662-3. 4 December.—A very cold day. (P.)

7 ,, —At my waking I found the tops of the houses covered with snow, which is a rare sight which I have not seen these three years. (P.)

8 ,, —A very hard frost which is news to us after having none almost these three year. (P.)

11 ,, —Having seen the strange and wonderful dexterity of the sliders on the new canal in St. James' Park performed before their Majesties by divers gentlemen and others with skates . . . . I went home by water, but not without exceeding difficulty, the Thames being frozen, great flakes of ice encompassing our boat.

,, —Then over the Park (St. James') where I first in my life, it being a great frost, did see people sliding with their skates, which is a very pretty art. (P.)

23 ,, —into the Park . . . the ice was broken and dangerous. (P.)

27 ,, —Raining. (P.)

1663-4. 6 December.—The greatest tide that ever was remembered in England to have been in this River (the Thames); all White Hall having been drowned. (P.)

1664-5. 1 January.—It was now exceeding cold and a hard long frosty season.

12 January.—The street full of footballs, it being a great frost. (P.)
14 ,, —Excessive sharp frost and snow.
16 February.—One of the coldest days, all say, they ever felt in England. (P.)

1665-6. 2 December.—Very exceeding hard frost and continues freezing (P.)
7 ,, —Frosty cold. (P.)
23 ,, —The plague is increased again this week notwithstanding there hath been a long day or two great frosts; but we hope it is only the effects of the late close warm weather. (P.)
2 February.—A most furious storm all night and morning. (P.)
3 ,, —The wind being again very furious . . . . bricks and tiles falling from the houses . . . . and whole chimneys, nay, whole houses in two or three places blowed down. (P.)
14 ,, —It was a frost and had snowed last night. (P.)

1666-7. 3 January.—It being frost and dry. (P.)
7 ,, —A most horrid cold night it was, frosty and moonshine (P.)
16 ,, —An excellent frosty day. (P.)
19 ,, —The breaking up of the frost. (P.)

1667-8. 18 January.—Raining. (P.)
16 February.—Raining. (P.)

1670-1. 25 December.—The thickest and darkest fog on the Thames that was ever known in the memory of man.
31 January.—This year the weather was so wet, stormy and unseasonable as had not been known in many years.

1671-2. 13 February.—An extraordinary snow.

1676-7. 20 December.—There fell so deep a snow as hindered us from Church.
22 ,, —To London, in so great a snow as I remember not to have seen the like.
27 ,, —More snow falling, I was not able to get to Church.

(*a*) 1680-1. 22 December. After many days and nights of snow, cloudy and dark weather, the comet was very much wasted.

1683-4. 2 January.—The Thames frozen.
6 ,, —It being in England this year one of the severest frosts that has happened of many years.
11 ,, —The weather continuing intolerably severe, streets of booths were set upon the Thames; the air was so very cold and thick as of many years there had not been the like.
16 ,, —The river quite frozen.
19 ,, —I went across the Thames on the ice now become so thick as to bear not only streets of booths, in which they roasted meat and had divers shops of wares, quite across as in a town but coaches, carts and horses passed over. So I went from Westminster stairs to Lambeth . . . . (returning) I walked over the ice from Lambeth-stairs to the Horseferry.
26 ,, —The Thames was filled with people and tents, selling all sorts of wares as in the City.
3 February.—The frost continuing more and more severe, the Thames before London was still planted with booths in formal streets, all sorts of trades and shops furnished and

full of commodities, even to a printing press . . . . Coaches plied from Westminster to the Temple and from several other stairs to and fro, as in the streets, sleds, sliding with skates, a bull baiting, horse and coach races, puppet plays . . . . so that it seemed to be a bacchanalian triumph or carnival on the water, whilst it was a severe judgment on the land, the trees not only splitting as if lightning-struck, but men and cattle perishing in divers places and the very seas so locked up with ice that no vessels could stir out or come in. The fowls, fish, and birds and all our exotic plants and greens, universally perishing . . . . Nor was this severe weather much less intense in most parts of Europe even as far as Spain and the most southern tracts. London by reason of the excessive coldness of the air hindering the ascent of the smoke, was so filled with the fuliginous steam of the sea coal, that hardly could one see across the streets and this filling the lungs with its gross particles exceedingly obstructed the breast so as one could scarcely breathe. Here was no water to be had from the pipes and engines, nor could the brewers and divers other tradesmen work, and every moment was full of disastrous accidents.

15 February.—It began to thaw but froze again. My coach crossed from Lambeth to the Horseferry at Millbank. The booths were almost all taken down.

(*b*) 18 ,, —The weather was set in to an absolute thaw and rain, but the Thames still frozen.

1684-5. 11 January.—It proved so sharp weather, and so long and cruel a frost, that the Thames was frozen across, but the frost was often dissolved and then froze again.

1685-6. 2 December.—Hitherto was a very wet warm season.

10 January.—The winter had hitherto been extraordinary wet and mild.

29 January.—So wet and mild a season had scarce been seen in man's memory.

1686-7. 8 January.—Little appearance of any winter as yet.

1688-9. 17 January.—A long frost and deep snow; the Thames almost frozen over.

1689-90. 21 January.—This night there was a most extraordinary storm of wind, accompanied with snow and sharp weather; it did great harm in many places, blowing down houses, trees, &c., killing many people. It began about two in the morning and lasted till five, being a kind of hurricane, which mariners observe have begun of late years to come northward. This winter has been hitherto extremely wet, warm and windy.

1690-1. 30 December.—Most of this month cold and frost.

1691-2. Up to 10 December.—An extraordinary dry and warm season, without frost and like a new spring; such as had not been known for many years.

5 January.—An exceeding dry and calm winter, no rain for many past months.

3 February.—A frosty and dry season continued.

17 ,, —An extraordinary snow fell in most parts.

1692-3. 14 February.—Hitherto an exceeding mild winter.

[1 March.]—Hitherto an exceeding warm winter, such as has seldom been known.

1693-4. 20 December.—A very great storm of thunder and lightning.

1694-5. 23 January.—The Thames was frozen over.

30 January.—The frost and continual snow have now lasted five weeks.

13 February.—The long frost intermitted but not gone.

1695-6. 4 January.—Hitherto mild, dark, misty weather. Now snow and frost.

12 February.—An extraordinary wet season, though temperate as to cold.

1696-7. 23 December.—Continuance of extreme frost and snow.

27 January.—The severe frost and weather relented, but again froze with snow.

(*c*) 17 February.—Severe frost continued with snow. Soldiers in the armies and garrison-towns frozen to death on their posts.

1698-9. 28 December.—Very warm, but exceeding stormy.

1699-1700. 4 December.—A gentle, calm, dry, temperate weather all this season of the year, but now came sharp, hard frost, and mist, but calm.

13 December.—Calm bright and warm as in the middle of April. So continued on 31st Jany. (21st O.S.).

4 February.—The weather was now altering into sharp and hard frost.

28 February.—Mild and calm season, with gentle frost, and little mizzling rain.

1700-1. 15 January.—An exceeding deep snow and melted away as suddenly.

30 ,, —Severe frost, and such a tempest as threw down many chimneys and did great spoil at sea.

1703-4. 2 December.—Wet and uncomfortable weather.

(*d*) 7-8 December.—The effects of the hurricane and tempest of wind, rain and lightning through all the nation especially London were very dismal. Many houses demolished and people killed, &c.

(*a*) The Comet alluded to is the celebrated one of 1680, which was investigated by Sir Isaac Newton in his "Principia."

(*b*) Evelyn records that the French mails got through two days later.

(*c*) A leaf of the original MS. following this date is lost, and the diary does not show how long this severe weather continued.

(*d*) This was the memorable storm of November 26th to December 1st (O.S.), 1703, when the Eddystone Lighthouse, built by Henry Winstanley, was blown down.

THAMES VALLEY RAINFALL NOVEMBER, 1911.

Symons's Meteorological Magazine.

Watershed of River Thames above Teddington, and River Lee above Feildes Weir.

Rainfall Stations reporting ·····

Isohyetals. ——

THE WEATHER OF NOVEMBER.

By FRED. J. BRODIE.

DURING the opening week the weather was influenced by deep cyclonic disturbances, whose centres passed along to the northward of the United Kingdom, mainly between Iceland and the Faeröe, and thence on to Scandinavia and northern Russia. Gales from south-west and west prevailed very generally; the storm of the 5th being in many places of great severity, and accompanied by heavy rain in Scotland. The strong south-westerly drift which swept up in the front of this disturbance resulted in day temperatures of 55° and upwards in nearly all parts of the country, the thermometer on the 4th or 5th rising to 60° at a few scattered places in England and Wales (including Westminster), and to 61° at Tottenham. Between the 8th and 13th disturbances continued to advance from the Atlantic following a more southerly track, across Ireland and England. In the south the wind continued to blow mainly from between south-west and west or north-west, but in Scotland it was more variable, and not infrequently from some easterly quarter. Temperature became somewhat lower, and between the nights of the 9th and 11th frost occurred in most districts, the sheltered thermometer falling at least 5° below the freezing point in many places, and at least 10° below it in some parts of Scotland. On the surface of the grass, minima of 20° or less were recorded at many northern stations, the exposed thermometer at Glasgow sinking to 15°, and at Llangammarch Wells to 11°. During the spell of variable cyclonic weather, thunder and lightning were observed in several isolated parts of the country. Between the 14th and 16th the Atlantic depressions took a more northerly course, and a mild south-westerly current of air again became general, the day temperatures exceeding 55° in most districts. On the 17th and 18th the passage of a complex depression, directly across the United Kingdom, was accompanied by heavy rain in the south-east of England, and snow and sleet in Scotland.

A complete change in the type of weather now took place, an anticyclone of increasing intensity passing very slowly eastwards along our more northern coasts and on to northern Europe, while a complex area of low pressure appeared over France and southern Europe. North-easterly winds of increasing strength consequently set in over the United Kingdom, blowing with the force of a gale in the Channel on the 16th, and although the weather became drier, showers of hail, sleet and snow were of rather frequent occurrence in our northern and eastern districts. Sharp frost occurred on the nights of the 20th or 21st, the sheltered thermometer falling to between 8° and 10° below the freezing point in many places, while instruments exposed on the grass sank to 16° at Newton Rigg and Aspatria and to 10° at Llangammarch Wells. After the 26th the northern anticyclone drifted away to central Russia, and low-pressure systems prevailed.

INTERNATIONAL BALLOON ASCENTS.

By W. H. DINES, F.R.S.

June 3rd, 1909.

Starting Point.	Country.	A miles.	B ° F.	C miles.	D ° F.	E miles.	F
Manchester....	England	6·9	—61	12·5	—53	41	N.E.
Pyrton Hill....	,, ...	7·2	—63	10·4	—49	40	N.
Petersfield	,, ...	6·9	—60	11·9	—43	44	N. by E.
Hamburg.....	Germany....	6·7	—66	15·5	—	63	E.
Lindenberg....	,, ...	7·4	—74	8·1	—56	50	E.
Paris.....	France.....	7·3	—67	8·4	?	94	N. by E.
Strassburg	Germany....	7·3	—80	14·0	?	44	N.E. by N.
Munich.....	,, ...	7·5	—76	8·2	?	51	E.N.E.
Vienna.....	Austria	7·5	—74	10·5	—69	23	S.E. by E.
Pavia	Italy.....	7·4	—78	9·1	?	26	N.N.E.
Pavlovsk	Russia	5·9	—49	9·8	—50	51	E. by S.
Kuchino	,, ...	6·6	—76	9·4	—58	121	E. by S.
Nizhni Olchidaeff	,, ...	6·8	—77	10·2	—58	39	S.E.

A Height in miles of commencement of isothermal column.
B Temperature, F°., at bottom of column.
C Greatest height of reliable record in miles.
D Temperature, F°., at greatest height.
E Distance in miles of point where balloon fell.
F Bearing of falling point from starting point.

On this occasion hourly ascents were made at Manchester, and many stations sent up three or four balloons. Out of 25 sent up at Manchester 18 were recovered, and Mr. Cave, at Ditcham Park, Petersfield, got four good traces. In the above table the successful ascent nearest to 7 a.m. has been taken, but it is much to be wished that some one would make a detailed study of the whole series of ascents.

On June 2nd an anticyclone lay to the westward of Ireland and a trough of low pressure stretched across from Spain to Finland. On the 3rd the high pressure had moved eastwards, and separate depressions were found over the Bay of Biscay and northern Russia.

The values of H_c (column A), are very uniform, excepting at Pavlovsk, where, in consequence of the higher latitude, a low value is the rule. The temperature of the isothermal column falls steadily from N.W. to S.E., and it is noteworthy that a large inversion was present over the whole area excepting Pavlovsk. At many stations the temperature at the highest point is vitiated by solar radiation.

In opposition to the ascents in May the general drift was to the east and north-east, but there is no great noticeable difference about the recorded temperatures.

ROYAL METEOROLOGICAL SOCIETY.

THE opening meeting of this Society for the present session was held on Wednesday evening, November 15th, at the Institution of Civil Engineers, Dr. H. N. Dickson, President, in the chair.

The President announced that the Council had that day awarded the Symons Gold Medal to Professor Cleveland Abbe, of the United States Weather Bureau, Washington, for the distinguished work which he had done in connection with meteorological science. The medal will be presented at the Annual Meeting of the Society.

Mr. Charles Harding read a paper on "The Abnormal Summer of 1911." He dealt with the data published in the *Weekly Weather Report* for each week from June 3rd to September 20th, and showed that the warmest weather was experienced in the English districts, although the temperature was generally in excess of the average for the entire kingdom. During the 18 weeks embraced by the whole period there were 15 weeks with the temperature above the average in England N.E., England E., Midland Counties and the English Channel. There was an excess in 14 weeks in England S.E. and England S.W., but not more than 12 warm weeks in any other part of the kingdom. The least number of warm weeks was 10 in the west of Scotland. The weeks with the greatest excess of temperature were those ending June 3rd and 10th, July 29th, August 5th, 12th, 19th, and September 9th.

Temperatures of 90° and above were limited solely to the English districts, but they occurred in all parts of England. The highest temperature reported from the stations used in the compilation of the *Weekly Weather Report* was 98° in the Midland counties, recorded during the week ending August 12th, and the highest temperatures for the whole period also occurred during this week in all the other English districts. There were six weeks in the east of England with a temperature of 90° or above, and five weeks in the Midland counties and in the south-east and south-west of England. Temperatures of 80° and above occurred in several districts for all weeks with the exception of those ending June 17th and 24th, July 1st, and September 23rd and 30th. The highest temperature in Scotland was 89°, and occurred in Scotland E. during the week ending July 15th; the maximum temperature in Ireland for the whole period also occurred during the same week, and was 88°.

The type of weather was mainly anticyclonic during the summer, but the only month with the mean barometric pressure especially high was July, when the mean at Greenwich, corrected and reduced to sea-level, was 30·15 in., which, during the last 100 years, was only exceeded in 1885, when the mean was 30·19 in. Mr. Harding pointed out that the facts which he had brought together showed that as far as temperature is concerned, the summer of 1911 was unique. The maximum temperature of 100° at Greenwich (96°·6 in the Stevenson screen) on August 9th, is the highest temperature

recorded in the British Isles since the establishment of comparable observations. The mean temperature for the summer was also higher than for any similar period during the last 70 years. The maximum temperature of 95°·6 on July 22nd has only been slightly exceeded on two previous occasions, and the September temperature of 94°·1 on the 8th has not previously been equalled during that month. So many hot days during the summer have never before been recorded. Mr. Harding further showed that the rainfall for the three summer months has only been smaller in three previous years during the period of 70 years, and also that the duration of bright sunshine was greater than in any previous summer since the introduction of sunshine recorders in 1881. As a consequence of the exceptional weather, the harvest was everywhere commenced at an earlier date than usual, and was quickly concluded.

Mr. H. Southall said that he did not believe that since 1880 there had been so long a dry period, taking a longer time than just the summer. In 1910, which was a very wet year in his district, he had 39 inches of rain at Ross; but from then to October 18th, 1911, he had only 10·64 in. This was lower than anything in the past 60 years.

Mr. F. J. Brodie said that if the weekly duration of sunshine in any locality exceeded half the possible amount the week might be regarded as extremely fine. In London the average annual number of such weeks in the 30 years ended 1910 was only 5, but in this year there were no fewer than 15 such weeks.

Mr. W. Marriott referred to some experiments on the effects of high temperatures on various substances, which he had carried out during the hot days in August and September. He said that there had been longer periods without rain than during the past summer. In the Meteorological Journal kept by the Rev. W. Cowe from 1795 to 1839 at Sudbury, Middlesex, there was a period of 49 consecutive days without rain, viz., from June 30th to August, 17th, 1800.

Mr. C. Salter gave some particulars respecting the drought in the Thames Valley above Teddington. Taking the three months, July—September, the general rainfall, as worked out by Dr. H. R. Mill, was 2·85 in., against an average of 6·68 in. These three months had a lower rainfall than ever recorded in any three consecutive summer months. There were, however, two previous instances of lower rainfall in three-monthly periods in the spring of 1893, and of these the most remarkable was March—May, when the three months' rainfall reached only 1·60 in. over the whole of the Thames Valley.

Colonel H. E. Rawson and Mr. E. Gold also spoke.

The following gentlemen were elected Fellows of the Society:—Prof. G. C. Chandra, Mr. H. M. A. Cooke, Mr. G. L. Courthorpe, M.P., Mr. H. A. P. Genge, Mr. W. Jowett, Mr. S. A. J. Keatinge, Pundit H. Lal, Mr. C. W. Marles, Mr. C. E. Morton, Mr. F. E. Norris, Mr. K. R. Parhawk, Capt. T. W. Pickard, Mr. J. Saunders, Mr. C. Y. Stevenson, Mr. G. R. Trafford, Mr. G. B. Wither, Mr. C. W. Wright.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE ZODIACAL LIGHT.

THE perusal of Mr. Henkel's interesting contribution to the November number of your Magazine, tempts me to refer to observations of the Light recorded by Mr. E. W. Maunder during passages to and from India, and while in India with the Eclipse Expedition of 1887-88. These observations formed the subject of a paper by him, which came before the Royal Astronomical Society in March, 1898. Mr. Maunder there expressed the opinion that the "spindle-shaped beam of light" (referring to that portion of the Light nearest to and extending from the horizon) consists of a disc of particles lying wholly within the Earth's orbit; at the same time the fact that a narrow prolongation of the Light is traceable more than 90° from the sun, and, if the Gegenschein be part of it, to actual opposition, proves, he thought, that a portion of it is derived from matter outside the Earth's orbit, and points to a flat ring of matter lying a good way outside. "A satellite of Saturn," he remarked, "revolving round its primary in the middle of the Cassinian division of the rings would offer some analogy to the position of the Earth with regard to the two divisions of the Zodiacal Light."

Mr. William Anderson, in "Notes on the Zodiacal Light," communicated to the Royal Astronomical Society in May, 1898, gave results of his observations of the Light obtained at Madeira in 1895-96.

He attributed the narrowing of the band prolonged across the sky to particles that extend from the neighbourhood of the sun to beyond the Earth's orbit, but taper off towards the edge outside its orbit.

To both observers the prolongation of the Light appeared as a narrow band; but, as mentioned in my letter of the 6th February last on "The Recurrence of Warm and Cold Periods," the Light was seen by myself and officers of my ship on several successive nights in August, 1899, and again later on while crossing the Pacific, clearly outlined right across the sky, having a breadth of from 18° to 20°.

These observations of the Light, and many others recorded during voyages across the Pacific in the years 1897-99, details of which may be here omitted, gave the impression of a ring of cosmical matter, encircling the Earth about the zodiac, from which light is reflected.

All astronomers appear to agree in attributing the Light to reflection from cosmical bodies situated between the Earth and the sun. This swarm of small bodies may therefore, with some reason, be regarded as a screen; and, if a screen of varying density, may it not periodically exercise a modifying effect upon the supply of solar heat to this planet?

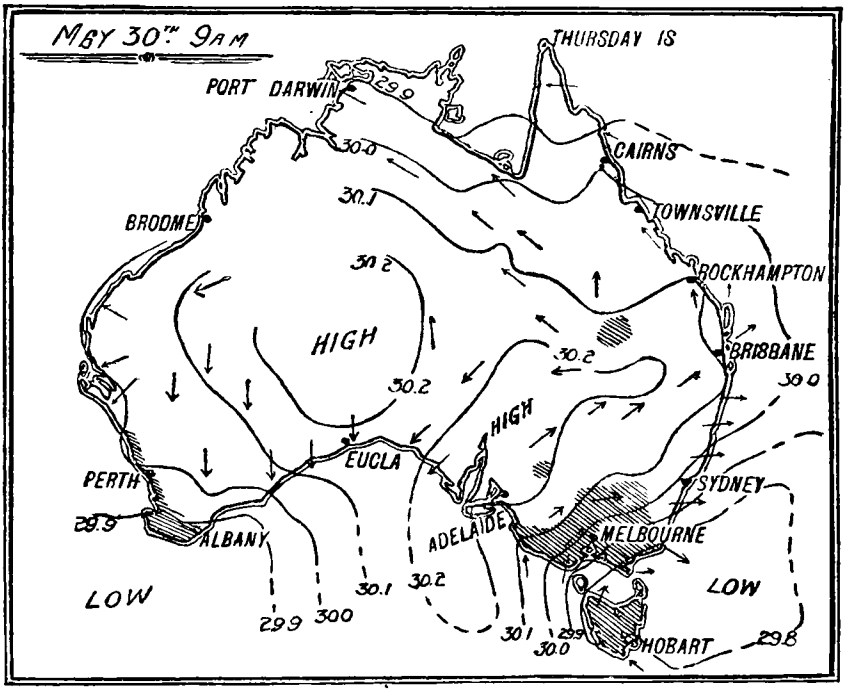
CAMPBELL HEPWORTH.

2, Amherst Road, Ealing, W., 2nd December, 1911.

WEATHER CHARTS IN AUSTRALIAN NEWSPAPERS.

I SEND a copy of the Melbourne *Argus* containing its first reproduction of the isobaric chart.

I believe a valuable work would be produced if the principal isobaric indications as determined by the world's meteorological services were collected and published under one cover. It is quite probable that from a study of a comparison of these peculiarities, new laws may be discovered common to all parts of the world.



With regard to the publication of the Weather Chart in the daily papers of Australia, it first appeared in the *Argus* some twenty years ago. In 1904 the *Daily Telegraph* of Sydney was the first journal in New South Wales to reproduce it in that State. The Adelaide morning and evening papers took the matter up in the following year, and the *Sydney Morning Herald* started to print it in 1908. The Melbourne *Age* commenced to publish the charts at the end of last year, the *Argus* has now followed suit, and we are hoping that the principal papers in the other States may also be persuaded to render a like service to their local communities. H. A. HUNT,

Commonwealth Meteorologist.

Meteorological Bureau, Central Office, Melbourne, 31st May, 1911.

[Australia is ahead of the mother country with regard to the publication of weather charts in newspapers. The only newspaper in the British Isles to publish isobaric charts is *The Times*, and the execution of the work is by no means equal to that in the Melbourne *Argus*, a very slightly reduced reproduction of which we give above.

ED. *S.M.M.*]

HEAT AND DROUGHT RECORDS AT GUERNSEY.

THE wonderful summer of 1911, which has established new records for heat and drought at so many places, did not pass without leaving its mark on Channel Islands weather. On several days in July and August we came near to topping the highest maximum temperature on record at this station, but it was not until Friday, September 8th, that we actually did so. Late in the season as it was, however, that day stands out, both as regards maximum temperature (88°·6) and mean (74°·6), as the hottest day at Les Blanches since observations were begun in January, 1894. The previous highest maximum temperature registered here was 86°·0 on September 1st, 1906, and the previous warmest day, July 19th, 1901, had a mean of 73°·3.

July, August and September, turn out to be the warmest and driest three months of the name in the 18 years, 1894—1911. Very curiously the three months last year were the coldest (mean temperature 58°), but not the wettest, of the series. This year's figures are:—

	Temperature.		Rainfall.		Rain days.
1911 (July-Sept.)	63°·3	.....	2·64 in.	.....	17
Average (1894—1903)	60°·2	.....	7·81 ,,	.....	39
Difference	+3°·1	.....	—5·17 ,,	.....	—22

BASIL T. ROWSWELL.

Les Blanches, Guernsey, 7th October, 1911.

OUR HOTTEST SUMMER.

IN reply to Miss Tawney's letter in the November number, I think we should bear in mind that there are two factors which invariably pull down the mean temperature of a hot summer month in England far below that of an average summer month in warm countries. One of these factors is the invariable occurrence in England of cool or relatively cool intervals between the spurts of great heat, and the other is the great rarity of hot nights in England. It is, indeed, probable that the 50th—60th parallel belt is at midsummer actually that of the coolest summer nights, for whereas in southern Europe the enormous accumulation of heat by day causes the nights to be insufferably hot, in the far north of Europe along the Arctic circle the absence or practical absence of "night" prevents any marked nocturnal cooling of the air.

I would repeat once more, however, that the most striking difference between northern and southern Europe, say between Britain and Italy, is in the power of the sun, rather even than in the temperature of the air, a fact which emphasizes again the supreme importance of meteorologists not confining their estimation of climate to the temperature of the air.

L. C. W. BONACINA.

November 22nd, 1911.

THE "SUPPOSED" COLD OF WINTER ANTICYCLONES.

By the Rev. John S. Begg.

As a slight local contribution towards answering the question whether winter anticyclones are characterised by colder weather than the average for the season, this paper deals from three points of view with the observations for the past four winters at West Linton, a valley station in Peeblesshire, Scotland, 800 feet above sea-level; winter being taken to cover the period November—March (inclusive).

A "spell of severe frost" is taken to mean a period of three days or more during which the screen minimum temperature fell below 14° F. (—10 C.) once at least, and below 23° F. (—5° C.) on each night of the spell. This is, of course, an arbitrary classification, but it corresponds fairly well with one's idea of a spell of severe frost.

Of such periods during the past four winters there have been six, to which may be added a seventh, November 19th—23rd, 1910, which just failed, indeed, at West Linton (though not at some other Scottish stations) to fulfil the first condition, but abundantly fulfilled the second. The main relevant facts in regard to these periods are: —

Table I.

PERIOD.	No. of Days	Lowest Screen Min.	Mean Screen Min.	CLOUD. 9 P.M. No. Cloudless.	CLOUD. 9 P.M. Mean (0-10).	CLOUD. 9 A.M. No. Cloudless.	CLOUD. 9 A.M. Mean (0-10).	Prevailing Wind Direction.	Pressure at West Linton.	Snow on Ground?
		(F.)°	°							
'08, Jan. 2-5	4	10·3	14·9	2	5·0	3	2·2	E.S.E.	High	Sprinkling
'09, Mar. 2-6	5	1·0	10·1	2	5·4	1	3·2	N. to W.	Low	Yes
'09, Nov 14-18	5	10·2	12·2	5	0·0	3	0·8	W.N.W.	Mod. High	No
'09, Dec. 4-8	5	6·0	12·5	4	2·0	2	4·6	W.S.W.	Low	Yes
'10, Jan. 21-23	3	7·3	11·4	2	0·7	2	3·3	W.N.W.	Neutral	,,
'10, ,, 25-28	4	—5·0	5·8	0	6·7	1	5·8	N. to W.	Low	,,
'10, Nov 19-23	5	14·7	18·0	3	2·0	2	3·4	W.N.W.	Mod. High	Sprinkling

So far, then, one would say that the height of the barometer is certainly not the determining factor in the occurrence of severe frosts, which may occur under either anticyclonic or cyclonic conditions; but that, on the whole, the severest frosts coincide with a low barometer and a snow-covered ground.

A striking example of the lack of apparent connection between temperature and absolute barometric pressure (as distinguished from the *relative* positions over north-western Europe of cyclones and anticyclones) is found in the two successive months November and December, 1910. Both were characterised by an unusually low pressure over Scotland, but while the former was one of the coldest Novembers on record, the latter was one of the mildest Decembers.

If we sub-divide days of the cyclonic or anti-cyclonic type into "clear" days and "cloudy" days, we may be able to gain some idea as to how far high (or low) barometer *combines* with clear (or cloudy) sky to give the most favourable conditions for a severe frost.

For this purpose a 24-hour period was classified as a "clear" day, if it combined a mean cloud percentage at 9 p.m. and 9 a.m. of 30 or less, with the recording of 50 per cent., or more, of the possible sunshine on the succeeding (or preceding) day; and as a "cloudy" day if it combined a mean cloud percentage of 90 per cent. or more with 5 per cent. or less of the possible sunshine.

These "clear" and "cloudy" days were then sub-divided into anticyclonic and cyclonic groups, according to the type of pressure-distribution at West Linton, as shown in the Daily Weather Report Maps, days of an ill-defined type being neglected.

The result of this analysis is given in Table II., from which we

TABLE II.—*West Linton.*

		No. of Days.	Mean Max.	Mean Min.	Mean Max. and Min.	Differences from Normal.*		
						Mean. Max.	Mean Min.	Mean.
CLEAR DAYS	Anticyclonic	31	41·6°	24·8°	33·2°	+0·2°	−5·4°	−2·6°
	Cyclonic	27	36·8	20·9	28·8	−4·7	−9·2	−7·0
CLOUDY DAYS	Anticyclonic	53	40·1	34·7	37·4	−0·4	+4·8	+2·2
	Cyclonic	66	41·9	34·6	38·3	+1·0	+4·7	+2·8

gather

(1.) That clear weather, whether of the anticyclonic or cyclonic type, is, as regards mean temperature, and especially as regards night temperatures, considerably colder than the average, while cloudy weather is warmer.

(2.) That while day temperatures are slightly lower in anticyclonic than in cyclonic cloudy weather, there is no difference in the night temperatures, which are, on the average, about 5° above the normal.

(3.) That the greatest departure from the normal occurs in clear cyclonic weather. This is due in part, no doubt, to the fact that while in anticyclonic clear weather the ground is frequently clear of snow—cyclonic clear weather frequently follows in the wake of a snowstorm; but, in any case, the facts do not lend much support, for this particular locality, to the theory that an anticyclone (as compared with a different pressure distribution) is a "focus of cold"; for *this* the most potent determining factor seems rather to be *clearness of sky*. When this is combined with absence of wind and

* In estimating the normal, account was taken of the fact that the proportion of days from each separate month varied slightly in the four groups.

the presence of a snow-covering, a severe frost is practically certain at such a station as West Linton, let the height of the barometer and even the direction of the wind be as they please ; although a low barometer with the wind blowing light from some point between north and west probably provide the most favourable accompaniments to the above conditions for the occurrence of a frost of abnormal severity. Speaking broadly, it might be said that severe frost is characteristic not of anticyclonic weather as such (taking the word in its usual sense as simply connoting a high barometer), but of "radiation" weather.

As a matter of fact we know now, from the growing wealth of observations in the upper air and at high-level observatories, that the air in an anticyclone is normally warm and dry, and that the severity of the frost, such as it is, which accompanies *clear** anticyclonic weather in valley stations (high or low) is an effect confined to them, and is due to the imprisonment in the valleys of lakes of cold air formed, under gravity, by the flowing down of air in contact with the surface of adjacent slopes, which have been themselves excessively cooled through radiation. Although this is most strikingly shown, as Hann proves, in a large tract of mountainous country like Switzerland, there are indications of it in miniature, to a modified degree, in the observations at Leith and Blackford Hill, Edinburgh, a neighbouring "ridge" station about 400 feet higher. A comparison of these two stations in the cases of clear weather, cited above for West Linton, shows that while in *cyclonic* clear weather the minima at both are about 4° below the normal, yet in *anticyclonic* clear weather, while the difference is again about 4° at Leith, it is only 1°·5 at Blackford Hill, showing a distinct relative warmth at the "ridge" station.

While Hann admits the need of qualifying the absolute statement that a winter anticyclone is cold, he maintains that severe cold characterises the anticyclonic "core," or central region of highest barometer.

It may therefore be of some interest to examine the cases during the past four winters in which an anticyclonic "core" has been situated in the neighbourhood of West Linton. "Neighbourhood"

TABLE III.

	Mean Max.	Mean Min.
West Linton.....	38°·2 (40°·8)	24°·4 (30°·1)
Blackford Hill.....	40°·0 (43°·7)	31°·6 (34°·4)
Leith	40°·1 (44°·4)	31°·7 (36°·3)

Mean cloud at West Linton, 9 p.m., 4·8 (6·5), 9 a.m., 5·7 (7·1).

* This would not exclude the case of shallow fogs forming in valleys, provided the slopes which supply the downward flow of cold air are themselves exposed to a clear sky.

in a meteorological connection must be taken in a somewhat wide sense, as occasions are extremely rare in which West Linton lies within the innermost isobar, as shown in the Daily Weather Maps; but taking all cases in which the point-centre, so far as can be judged, lay within 350 miles of West Linton, *i.e.*, when it lay anywhere over the United Kingdom or the North Sea, the four winters contribute 33 such days, the mean maximum and minimum temperatures of which at West Linton, Blackford Hill and Leith, compared with the normal (in brackets), are given in Table III.

While the mean amount of cloud, during the presence of the anticyclonic core in the neighbourhood, is rather less than the average, this is hardly sufficient in itself to account for the marked reduction in temperature, particularly in the minima; for it is a larger reduction than occurs with still clearer weather under conditions which, though anticyclonic, are on the whole less decisively so than in this case (see Table II.). Also, an examination of the wind directions on these 33 days shows a percentage distribution from the four quadrants almost identical with the normal winter distribution, so that the depression in temperature is not due to a preponderance of winds from the northerly half of the compass. On the other hand, the figures do indicate that in weather of this type the valley station at Leith, in spite of its greater proximity to the sea and lower altitude, is no warmer than the "ridge" station on Blackford Hill, which, so far as it goes, is quite in favour of the belief that in the free air at some height above local irregularities in the Earth's surface, the anticyclone would be found to be warm rather than cold.

In conclusion, while the total number of all these observations is hardly sufficient to justify general statements, the following summary might be hazarded, to await further observations at other times and in other localities for corroboration or the reverse.

(*a.*) The spells of severest frost occur with a *low* barometer, in quiet, clear weather, with the ground snow-covered.

(*b.*) Clearness of sky is the most potent factor operating in favour of the occurrence of winter frost.

(*c.*) To be in the neighbourhood of an anticyclonic "core" does seem to have a decided lowering effect upon the winter temperature at stations whose situation is low in comparison with the surrounding country, but this is quite compatible with the great mass of the air over an anticyclonic region being warm (for the season).

(*d.*) The support given to the theory of the "supposed" cold of winter anticyclones is confined to such cases as are referred to in the preceding section, there being no evidence that the extensive "suburbs," so to speak, of an anticyclone, at any level, experience an average temperature below the seasonal mean.

RAINFALL TABLE FOR NOVEMBER, 1911.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea.	RAINFALL OF MONTH.	
					Aver. 1875—1909.	1911.
		° ′	° ′	ft.	in.	in.
Camden Square	*London*	51 32	0 8	111	2·34	3·62
Tenterden	*Kent*	51 4	*0 41	190	3·07	4·85
Arundel (Patching)	*Sussex*	50 51	0 27	130	3·54	7·45
Southampton (Cadland)	*Hampshire*	50 50	1 22	52	3·39	5·24
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	2·25	2·26
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	2·23	2·72
Shoeburyness	*Essex*	51 31	*0 48	13	2·09	3·30
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·40	3·80
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	2·49	2·98
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	4·07	5·59
Rousdon [Lyme Regis]	,,	50 41	3 0	516	3·51	3·92
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·77	3·21
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·94	4·12
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·61	3·09
Boston	*Lincolnshire*	52 58	0 1	25	2·05	2·84
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	1·98	2·78
Macclesfield	*Cheshire*	53 15	2 7	501	3·00	2·76
Southport (Hesketh Park)	*Lancashire*	53 38	2 59	38	3·16	3·16
Wetherby (Ribston Hall)	*Yorkshire, W.R.*	53 59	1 24	130	2·34	3·54
Arncliffe Vicarage	,, ,,	54 8	2 6	732	6·12	9·67
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·34	3·22
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·63	3·74
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	13·59	18·08
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	4·08	7·28
Haverfordwest	*Pembroke*	51 48	4 58	95	5·16	7·02
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	4·50	7·07
Llandudno	*Carnarvon*	53 20	3 50	72	3·19	2·77
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·35	6·92
Marchmont House	*Berwick*	55 44	2 24	498	3·21	5·47
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	5·24	5·05
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·63	5·46
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	7·39	10·37
Mull (Quinish)	,,	56 34	6 13	35	6·24	5·82
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·62	2·82
Braemar	*Aberdeen*	57 0	3 24	1114	3·76	6·90
Aberdeen (Cranford)	,,	57 8	2 7	120	3·29	4·73
Cawdor	*Nairn*	57 31	3 57	250	2·60	6·47
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	4·51	8·91
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	8·90	8·99
Dunrobin Castle	*Sutherland*	57 59	3 56	14	3·25	4·37
Wick	*Caithness*	58 26	3 6	77	2·95	3·30
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	5·54	7·25
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·80	4·14
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	3·88	6·59
Miltown Malbay	*Clare*	52 52	9 26	400	4·50	5·34
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	3·41	4·17
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·28	4·58
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·64	3·02
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	3·38	4·93
Ballinasloe	*Galway*	53 20	8 15	160	3·59	5·36
Crossmolina (Enniscoe)	*Mayo*	54 4	9 18	74	5·75	8·62
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	4·02	5·82
Seaforde	*Down*	54 19	5 50	180	3·86	3·85
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	3·77	4·03
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·66	4·70

RAINFALL TABLE FOR NOVEMBER, 1911—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875–1909. in.	1911. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875–1909. in.	STATION.
+1·28	155	·68	11	19	22·98	20·59	—2·39	90	25·11	Camden Square
+1·78	158	·93	18	21	24·87	22·32	—2·55	90	27·64	Tenterden
+3·91	210	1·37	17	16	27·57	25·99	—1·58	94	30·48	Patching
+1·85	155	1·30	11	18	28·64	22·46	—6·18	78	31·87	Cadland
+ ·01	100	·57	11	16	22·52	14·84	—7·68	66	24·58	Oxford
+ ·49	122	·44	19	21	23·04	16·66	—6·38	72	25·17	Croyland Abbey
+1·21	158	·85	17	18	17·57	15·63	—1·94	89	19·28	Shoeburyness
+1·40	158	1·71	18	22	23·26	20·81	—2·45	89	25·40	Westley
+ ·49	120	1·23	18	19	21·66	17·30	—4·36	80	23·73	Geldeston
+1·52	137	·59	7	24	33·81	28·13	—5·68	83	38·27	Polapit Tamar
+ ·41	112	·95	11	21	29·86	19·47	—10·39	65	33·54	Rousdon
+ ·44	116	·63	11	24	27·10	19·12	—7·98	71	29·81	Stroud
+1·18	140	·77	9	24	29·42	22·53	—6·89	77	32·41	Wolstaston
+ ·48	118	·68	27	22	26·32	16·85	—9·47	64	28·98	Coventry
+ ·79	138	·45	26	27	21·47	18·95	—2·52	88	23·35	Boston
+ ·80	140	·52	19	20	22·29	14·93	—7·36	67	24·46	Hodsock Priory
— ·24	92	·42	12	21	31·38	25·02	—6·36	80	34·73	Macclesfield
·00	100	·41	11	20	29·60	25·32	—4·28	86	32·70	Southport
+1·20	151	·46	19	22	24·60	21·71	—2·89	88	26·87	Ribston Hall
+3·55	157	·85	26	20	54·74	60·98	+6·24	111	61·49	Arncliffe
+ ·88	138	·65	26	23	24·10	21·25	—2·85	88	26·42	Hull
+1·11	142	·80	18, 19	22	25·48	24·65	— ·83	97	27·94	Newcastle
+4·49	133	3·34	3	21	114·34	121·14	+6·80	106	129·48	Seathwaite
+3·20	178	·83	12, 15	22	37·58	31·84	—5·74	85	42·28	Cardiff
+1·86	136	·79	12	23	41·63	38·18	—3·45	92	46·81	Haverfordwest
+2·57	157	1·40	12	20	40·80	40·27	— ·53	99	45·46	Gogerddan
— ·42	87	·33	11	20	27·52	25·43	—2·09	92	30·36	Llandudno
+2·57	159	·97	4	18	38·63	39·61	+ ·98	103	43·47	Cargen
+2·26	170	1·20	17	23	30·93	26·95	—3·98	87	33·76	Marchmont
— ·19	96	·58	1, 5	23	44·29	39·77	—4·52	90	49·77	Girvan
+1·83	150	·87	3	18	32·02	32·20	+ ·18	101	35·97	Glasgow
+2·98	140	1·67	5	19	60·10	71·21	+11·11	118	68·67	Inveraray
— ·42	93	·72	14	19	49·98	48·14	—1·84	96	56·57	Quinish
+ ·20	108	·49	15	23	25·97	12·70	—13·27	49	28·64	Dundee
+3·14	184	...	...	...	31·80	25·81	—5·99	81	34·93	Braemar
+1·44	144	·76	15	26	29·30	22·37	—6·93	76	32·73	Aberdeen
+3·87	248	1·22	9	15	26·80	26·42	— ·38	99	29·33	Cawdor
+4·40	197	1·51	16	25	38·91	39·30	+ ·39	101	44·53	Fort Augustus
+ ·09	101	1·10	4	22	74·07	79·85	+5·78	108	83·61	Bendamph
+1·12	134	·93	15	21	28·81	23·64	—5·17	82	31·90	Dunrobin Castle
+ ·35	112	·40	12	21	26·77	24·43	—2·34	91	29·88	Wick
+1·71	131	1·10	14	22	47·89	43·98	—3·91	92	54·81	Killarney
+ ·34	109	·96	13	19	35·25	32·82	—2·43	93	39·57	Waterford
+2·71	170	1·01	14	20	35·09	34·06	—1·03	97	39·43	Castle Lough
+ ·84	119	·77	1	20	40·27	34·77	—5·50	86	45·11	Miltown Malbay
+ ·76	122	·70	12	20	31·57	26·48	—5·09	84	34·99	Courtown Ho.
+1·30	140	1·07	12	22	32·51	30·51	—2·00	94	35·92	Abbey Leix
+ ·38	114	·61	12	23	25·41	19·41	—6·00	76	27·68	Dublin
+1·55	146	·67	12	22	32·76	31·99	— ·77	98	36·15	Mullingar
+1·77	149	·90	14	21	32·95	32·79	— ·16	100	36·64	Ballinasloe
+2·87	150	1·17	14	26	46·76	43·20	—3·56	92	52·87	Enniscoe
+1·80	145	·81	14	18	38·37	35·03	—3·34	91	42·71	Markree
— ·01	100	·79	17	22	35·14	26·15	—8·99	74	38·91	Seaforde
+ ·26	107	·40	16	22	33·69	26·07	—7·62	77	37·56	Dundarave
+1·04	128	·50	5	22	35·47	32·42	—3·05	91	39·38	Omagh

SUPPLEMENTARY RAINFALL, NOVEMBER, 1911.

Div.	STATION.	Rain inches	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road	5·43	XI.	Lligwy	3·92
,,	Ramsgate	4·00	,,	Douglas	5·17
,,	Hailsham	7·13	XII.	Stoneykirk, Ardwell House	4·52
,,	Totland Bay, Aston House.	5·07	,,	Dalry, The Old Garroch	8·42
,,	Stockbridge, Ashley	3·99	,,	Langholm, Drove Road	6·45
,,	Grayshott	4·95	,,	Beattock, Kinnelhead	6·67
,,	Reading, Calcot Place	3·32	XIII.	StMary'sLoch,CramiltLdge	7·81
III.	Harrow Weald, Hill House.	3·25	,,	North Berwick Reservoir	4·09
,,	Pitsford, Sedgebrook	2·39	,,	Edinburgh, Royal Observty.	4·41
,,	Woburn, Milton Bryant	2·98	XIV.	Maybole, Knockdon Farm..	5·00
,,	Chatteris, The Priory	2·50	XV.	Campbeltown, Witchburn	6·03
IV.	Colchester, Lexden	3·26	,,	Glenreasdell Mains	7·15
,,	Newport	3·57	,,	Holy Loch, Ardnadam	12·96
,,	Rendlesham	3·06	,,	Ballachulish House	12·17
,,	Swaffham	3·96	,,	Islay, Eallabus	6·54
,,	Blakeney	3·48	XVI.	Dollar Academy	6·84
V.	Bishops Cannings	2·90	,,	Balquhidder, Stronvar	11·26
,,	Winterbourne Steepleton	5·35	,,	Coupar Angus	3·58
,,	Ashburton, Druid House	7·27	,,	Glenlyon, Meggernie Castle.	10·84
,,	Okehampton, Oaklands	6·66	,,	Blair Atholl	5·36
,,	Cullompton	3·91	,,	Montrose,SunnysideAsylum	3·66
,,	Hartland Abbey	4·31	XVII.	Alford, Lynturk Manse	5·78
,,	Lynmouth, Rock House	6·08	,,	Fyvie Castle	6·06
,,	Probus, Lamellyn	4·15	,,	Keith Station	6·48
,,	North Cadbury Rectory	2·71	XVIII.	Glenquoich, Loan	16·50
VI.	Clifton, Pembroke Road	4·73	,,	Skye, Dunvegan	8·76
,,	Ross, The Graig	2·75	,,	N. Uist, Lochmaddy	4·25
,,	Shifnal, Hatton Grange	2·53	,,	Alvey Manse	6·78
,,	Blockley, Upton Wold	2·94	,,	Loch Ness, Drumnadrochit.	7·92
,,	Droitwich	2·47	,,	Glencarron Lodge	9·02
VII.	Market Overton	2·55	XIX.	Invershin	5·95
,,	Market Rasen	2·94	,,	Loch Stack, Ardchullin	7·75
,,	Bawtry, Hesley Hall	2·36	,,	Melvich	4·36
,,	Derby, Midland Railway	2·12	XX.	Skibbereen Rectory	5·94
,,	Buxton	5·10	,,	Dunmanway, The Rectory..	9·60
VIII.	Nantwich, Dorfold Hall	2·58	,,	Cork	5·25
,,	Chatburn, Middlewood	4·87	,,	Mitchelstown Castle	4·53
,,	Cartmel, Flookburgh	5·90	,,	Darrynane Abbey	6·87
IX.	Langsett Moor, Up. Midhope	5·61	,,	Clonmel, Bruce Villa	4·44
,,	Scarborough, Scalby	5·12	,,	Newmarket-on-Fergus,Fenloe	...
,,	Ingleby Greenhow	4·68	XXI.	Laragh, Glendalough	11·45
,,	Mickleton	4·02	,,	Balbriggan, Ardgillan	3·45
X	Bellingham, High Green Manor	5·77	,,	Moynalty, Westland	..
,,	Ilderton, Lilburn Cottage	3·99	XXII.	Cong, The Glebe	7·55
,,	Keswick, The Bank	7·36	,,	Westport, St. Helens	6·35
XI.	Llanfrechfa Grange	6·89	,,	Achill Island, Dugort	9·71
,,	Treherbert, Tyn-y-waun	14·64	,,	Mohill, The Rectory	5·19
,,	Carmarthen, The Friary	8·62	XXIII.	Enniskillen, Portora	5·03
,,	Castle Malgwyn [Llechryd].	7·21	,,	Dartrey [Cootehill]	4·48
,,	Plynlimon	14·40	,,	Warrenpoint, Manor House	4·97
,,	New Radnor, Ednol	4·70	,,	Banbridge, Milltown	2·89
,,	Rhayader, Tyrmynydd	7·87	,,	Belfast, Cave Hill Road	4·69
,,	Lake Vyrnwy	...	,,	Glenarm Castle	4·35
,,	Llangyhanfal, Plâs Draw	2·79	,,	Londonderry, Creggan. Res.	4·66
,,	Dolgelly, Bryntirion	8·01	,,	Killybegs	7·25
,,	Bettws-y-Coed, Tyn-y-bryn	9·68	,,	Horn Head	5·52

METEOROLOGICAL NOTES ON NOVEMBER, 1911.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—There were several bright days in the early part, but the month generally was dull and rainy. Mean temp. 44°·4 or 0°·9 above the average, this being the seventh month in succession with temp. above the average. Duration of sunshine, 46·1* hours, and of R 62·8 hours. Evaporation ·37 in. Shade max. 59·1 on 4th; min. 27°·7 on 22nd. F 3, f 7.

TENTERDEN.—A fairly warm month, with a cool spell from 22nd to 27th. Very wet 7th to 19th. Duration of sunshine, 55·0† hours. Shade max. 58°·5 on 4th; min. 24°·5 on 22nd F 3, f 11.

TOTLAND BAY.—Duration of sunshine, 84·0* hours. Shade max. 58°·0 on 1st and 4th; min. 28°·2 on 27th. F 2, f 10.

MILTON BRYANT.—Dull and wet generally. Mean temp. 41°·4. Shade max. 55°·0 on 12th; min. 24°·0 on 22nd. F 11.

WINTERBOURNE STEEPLETON.—R about an inch in excess of the average, but the total for the eleven months of the year about 6 inches below the average. Shade max. 56°·8 on 4th; min. 24°·0 on 22nd. F 10, f 16.

ROSS.—The R in the 349 days ending November 30th was only 14·99 in., and is the smallest in the same time for 93 years. Shade max. 57°·7 on 4th; min. 28°·0 on 22nd. F 8.

HODSOCK PRIORY.—Shade max. 56°·6 on 1st and 4th; min. 28°·7 on 21st. F 7, f 17.

SOUTHPORT.—Duration of sunshine 66·7* hours, or 15·4 hours above the average. Duration of R 63·5 hours. Mean temp. 43°·4. A whole gale on 5th, with gusts over 80 miles per hour. Shade max. 56°·2 on 5th; min. 27°·3 on 11th. F 2, f 13.

HULL.—A dull month, with frequent but not very heavy R. Mild to 26th, then colder, with squally, sleet showers at times. Dense fogs on 29th and 30th. High wind all day on 5th. Shade max. 56°·0 on 5th; min. 29°·0 on 29th. F 2, f 10.

HAVERFORDWEST.—Wet, stormy and mild. TSS on 10th and 17th. Duration of sunshine 85·0* hours. Shade max. 57°·6 on 5th; min. 22°·3 on 4th.

BETTWS-Y-COED.—Shade max. 56°·0 on 13th and 15th; min. 29°·0 on 26th. F 4, f 10.

CARGEN.—The first half was wet and stormy, but the second half fine and dry. A heavy gale on 5th did considerable damage to growing timber and buildings. Shade max. 54°·8 on 3rd; min. 26°·0 on 21st. F 6.

EDINBURGH.—Shade max. 55°·5 on 14th; min. 30°·9 on 21st. F 3, f 10.

COUPAR ANGUS.—The first month of the year with R above the average. Shade max. 53°·0 on 4th; min. 26°·0 on 10th.

FORT AUGUSTUS.—Shade max. 54°·0 on 15th; min. 28°·5 on 25th. F 10.

LOCH STACK.—Duration of sunshine, 51·0 hours.

DUNMANWAY.—First 14 days very wet. R commenced to fall at 6 p.m. on 13th and, with the exception of 3 hours on 14th, it fell steadily until 10 a.m. on 15th, making 3·75 in. in 40 hours. Great flood in River Bandon.

DUBLIN.—A changeable, showery month. Mean temp. 44°·1, or 1°·1 below the average for November. Shade max. 57°·5 on 14th; min. 30°·4 on 22nd. F 4, f 5.

MARKREE.—R during the first 18 days, but the remainder of the month was fair, with frosts on most nights. Shade max. 56°·7 on 14th; min. 22°·8. F 12, f 16.

WARRENPOINT.—A wet month with high winds, chiefly westerly. Shade max. 54°·0 on 14th; min. 31°·0 on 10th. F 1, f 3.

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* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, June, 1911.

STATIONS (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
								0-100			inches		
London, Camden Square	87°·6	5	41°·8	15	71°·8	52°·2	52°·3	74	126°·3	34°·4	2·69	11	6·1
Malta	86·0	9*	61·1	2	78·8	66·5	62·5	70	140·0	...	·10	1	2·7
Lagos	89·0	22	70·0	12	83·6	73·4	73·1	82	150·0	66·0	25·35	24	...
Cape Town	81·0	21	37·0	15	64·9	48·3	48·5	75	...	...	4·55	11	5·4
Johannesburg	63·8	21	25·0	27	57·7	38·2	36·0	72	118·0	23·0	·00	0	1·2
Mauritius	80·3	15	54·8	11†	76·5	61·8	60·3	75	142·7	45·9	3·86	12	4·9
Calcutta...	96·4	28	73·7	15	90·5	78·9	77·7	84	...	72·7	11·07	13	7·4
Bombay...	93·0	1	76·2	14	88·0	79·9	77·4	82	130·5	74·6	10·85	18	7·2
Madras	106·4	1	72·6	4	99·7	82·3	72·3	63	145·4	72·6	·63	5	4·8
Kodaikanal	67·8	16	51·9	14	63·5	53·7	52·0	83	147·8	44·7	7·19	24	7·1
Colombo, Ceylon ...	87·7	20	73·2	10	85·6	77·1	74·9	81	137·6	70·4	4·08	11	7·5
Hongkong	91·3	18	75·0	1	87·2	79·7	76·8	82	142·0	...	5·09	19	7·0
Sydney	65·3	16	38·9	24	59·7	46·0	40·0	71	111·3	28·1	·21	13	4·0
Melbourne	61·2	17	34·8	29	54·2	43·1	41·9	77	96·9	27·9	3·72	20	6·7
Adelaide	65·6	15	40·0	23	58·9	46·9	45·9	79	119·7	30·3	2·52	18	6·8
Perth	69·2	24	38·0	18	63·3	46·3	46·4	73	118·5	31·0	3·58	12	4·4
Coolgardie	67·2	25	34·2	21	60·8	41·8	42·0	71	139·0	30·0	1·29	12	3·8
Hobart, Tasmania ...	59·0	16	33·0	22	51·5	40·7	38·7	76	105·4	28·7	1·89	19	6·2
Wellington	62·0	3	35·4	16	54·9	46·6	38·8	63	99·0	29·0	4·81	22	6·5
Auckland	63·5	23	38·5	26	59·0	47·6	47·2	79	108·0	34·0	5·39	19	6·1
Jamaica, Kingston ..	95·2	25	72·4	27	90·6	74·8	71·4	70	...	...	·37	3	5·4
Grenada	85·0	sev.	71·0	5	82·3	74·1	...	83	140·0	...	19·36	27	7·0
Toronto	91·6	22	47·2	6	75·4	55·7	...	...	108·0	44·4	1·53	13	5·6
Fredericton	85·0	9	37·8	25	71·5	48·9	...	74	...	...	5·79	11	6·6
St. John, N.B. ...	81·3	30	44·3	3	67·1	51·1	...	...	...	...	3·15	15	5·8
Victoria, B.C.	73·2	10	40·2	19	65·1	47·6	...	68	...	...	·73	7	6·0
Dawson	83·0	22	31·0	2	71·7	41·7	...	...	...	...	·87	9	5·4

* and 27. † and 12.

MALTA.—Mean temp. of air 71°·9. Average bright sunshine 11·1 hours per day.

Johannesburg.—Bright sunshine, 272 hours.

Mauritius.—Mean temp. of air 0°·1, dew point 0°·7, and R 1·28 in., below averages. Mean hourly velocity of wind 9·9 miles, or equal to average.

KODAIKANAL.—Bright sunshine, 122 hours. T88 on eight days.

COLOMBO.—Mean temp. of air 77°·9, or 2°·9 below, of dew point 0°·7 above, and R 3·40 in. below, averages. Mean hourly velocity of wind 8·4 miles.

HONGKONG.—Mean temp. of air 82°·9, or 2°·2 above, R 11·29 in. below, and sunshine 248·5 hours, or 93·3 above, averages. Wind mean velocity 11·6 miles.

Sydney.—Mean temp. of air 1°·4 below, and R 4·97 in. below, averages.

Melbourne.—Mean temp. of air 1°·7 below, and R 1·62 in. above, averages.

Adelaide.—Mean temp. of air 0°·5 below, and R ·49 in. below, averages.

Perth.—Mean temp. of air 2°·0 below, and R 3·08 in. below, averages.

Hobart, Tasmania.—Mean temp. of air 1°·0 below, and R ·32 in. below, averages.

Wellington.—Mean temp. of air 1°·3 above, and R ·27 in. below, averages. Bright sunshine 119·4 hours.

Auckland.—Rainfall 1·70 in. above average.

Royal Geographical Society's Publications.

THE GEOGRAPHICAL JOURNAL.

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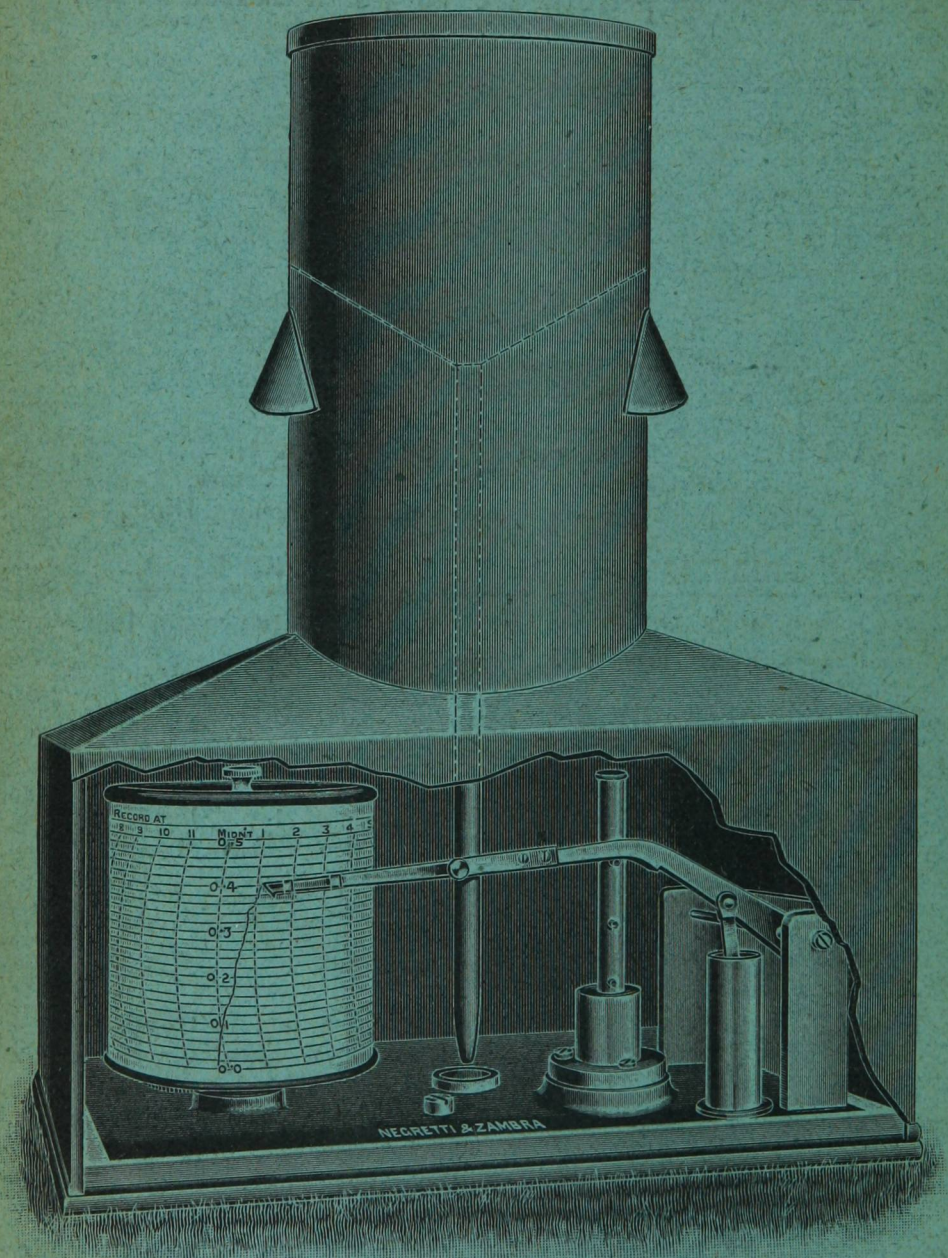

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